Yellow Starthistle Biology and Management

Yellow starthistle, *Centaurea solstitialis*, is native to Eurasia and was introduced to California around 1850 via South America. It is now present throughout California, typically found in open areas on roadsides, rangeland, wildlands, hay fields, pastures, and waste areas. Yellow starthistle is moving into the central Sierras, cause for concern for all who enjoy Recent reports indicate that yellow starthistle infests between 10 and 15 million acres in California. The disturbance created by cultivation, poorly timed mowing, road building and maintenance, or overgrazing favors this rapid colonizer. It forms dense infestations and rapidly depletes soil moisture, thus preventing the establishment of other species. It is also poisonous to horses, causing a nervous disorder called "chewing disease" (nigropallidal encephalomalacia) that is fatal once symptoms develop. Horses are the only animal known to be affected in this manner and should not be allowed to graze on yellow starthistle.

IDENTIFICATION

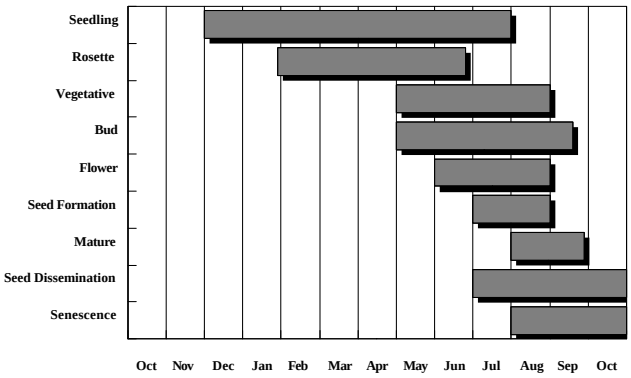
Yellow starthistle is a gray-green to blue-green plant with a deep vigorous taproot. It produces bright, thistlelike yellow flowers with sharp spines surrounding the base. Yellow starthistle grows to heights varying from 6 inches to 5 feet. The stems of mature plants are rigid, spreading, and typically branching from the base in open areas. Stems and leaves are covered with a loose, cottony wool that gives them a whitish appearance. Stems appear winged due to leaf bases that extend beyond the nodes. Basal leaves are 2 to 3 inches long and deeply lobed. Upper leaves are short (0.5 to 1 inch long) and narrow with few lobes. The first 6 to 8 leaves are entire on the seedling and lobed on subsequent leaves.

Yellow starthistle seedling (top), flower (bottom left) and cotton top (bottom right).

BIOLOGY

Yellow starthistle is a long-lived winter annual that is usually found below 6,000 feet elevation in dry, light-intensive areas where average annual rainfall is between 10 and 60 inches. Seed output can be as high at 30,000 seeds per square meter, with about 95% of the seed being viable soon after dispersal. Most seeds germinate within a year of dispersal, but some can remain viable in the soil for more than 3 years.

Yellow starthistle seeds germinate from fall through spring, which corresponds to the normal rainy season in California. After germinating, the plant initially allocates most of its resources to root growth. By late spring, roots can extend over 3 feet into the soil profile, although the portion above ground is a relatively small basal rosette. This allows yellow starthistle to out-compete shallow-rooted annual species during the drier summer months when moisture availability is limited near the soil surface. It also helps explain why yellow starthistle survives well into the summer, long after other annual species have dried up, and why it can grow again after top removal from mowing or grazing.



Seasonal changes in growth and development of yellow starthistle.

Yellow starthistle does best in high light conditions found along roadsides, in disturbed sites, grasslands, and on south-facing slopes at higher elevations. If other plants compete for light early in the growing season, yellow starthistle does not grow well and can be out competed.

MANAGEMENT

Prevention		
Method	Description	Timing
Weed free gravel and soil piles used in road contsruction/maintenance	1. Tarp smaller piles 2. Herbicide application to small weeds on/around piles	Late Winter to Spring
Weed Free Hay/Straw	1. Use alfalfa hay from 2nd to 4th cutting from stands 4 years or younger. 2. Use straw from fields uninfested with yellow starthistle.	Any Time
Planting with certified seed	1. Replant areas with certified seed because it doesn't have weed seeds in it.	
Monitor Loading & Feeding Areas	1. Animals may bring in weed seed that grows in load/feed areas resulting in seed moving from load/feed areas into the surrounding areas by animals.	Winter to Summer
Roadside and High use area survey for yellow starthistle	1. Yellow starthistle is highly visible in the fall at the cotton top stage. Secondarily, yellow starthistle is visible in late winter with its blue-green color.	Fall to Late Winter

Cultural Control		
Method	Description	Timing
Cultivation	1. When soil is dry but still workable, cultivation will control yellow starthistle.	April - June
Mowing	1. Mow when 5% of flowers are in full bloom. 2. When proper timing is not practical, mowing later than 5% bloom is better than pre-bloom. 3. Mow again when remaining plants grow to 5% bloom.	May- June (repeat as necessary)
Grazing	1. Prioritize pasture rehabilitation and stock animals into priority pasture(s) when yellow starthistle is at pre-spine stage. 2. Rotate back into priority pasture when yellow starthistle is again at pre-spine stage. 3. Stock at high density for a short duration.	May-June (repeat as necessary)
Burning	1. Burn at the end of the rainy season.	April-May
Seed competitive plants	1. Pastures – plant late maturing legumes. 2. Some legumes benefit from mid winter grazing. 3. Do not graze in late winter through mid spring. 4. Cultivate then plant perennial grasses, chemical fallow if planting in Feb. Species that have established in some areas include California brome, Warrior orchardgrass, and intermediate wheatgrass.	Sept.-Oct. Jan – Feb After mid June Oct-Nov or Feb

Chemical Control		
Method	Description	Timing
Transline (Clopyralid)	1. Apply 4 to 10 oz formulated product per acre. 2. Economic treatment is 5 oz applied in Jan. to Feb.	Dec. to Mar.
2,4-D (several products)	1. Apply 0.5 to 0.75 lb active ingredient per acre. 2. Apply to small rosettes. 3. Restricted pesticide for larger areas require purchase of a container larger than 1 quart.	Jan. to Mar.
Banvel (dicamba)	1. Apply 0.25 lb active ingredient per acre on rosettes up to 1.5 inches in diameter. 2. Apply 0.5 to 0.75 lb active ingredient per acre on rosettes larger than 1.5 inches in diameter. 3. Restricted pesticide for larger areas that require purchase of a container larger than 1 quart.	Jan. to Mar.
Remedy (triclopyr)	1. Apply 0.5 to 1.5 lb active ingredient per acre.	Jan. to Mar.
Roundup (glyphosate) (several other products as well)	1. Apply 1.0 lb active ingredient per acre. 2. The active ingredient, glyphosate, will kill or injure many plant species. Keep away from desirable plants.	Late Mar to mid May
Telar (chlorsulfuron)	1. Apply 1 to 2 oz active ingredient per acre prior to emergence of yellow starthistle. 2. Not for use in pasture, rangeland or around the home. Roadside and noncrop use only. 3. Dust from treated areas carries the herbicide and can injure susceptible plants	Oct. to Dec.
Oust (metsulfuron)	1. Apply 1 to 2 oz active ingredient per acre prior to emergence of yellow starthistle. 2. Not for use in pasture, rangeland or around the home. Roadside and noncrop use only. 3. Dust from treated areas carries the herbicide and can injure susceptible plants	Oct. to Dec.

Biological Control		
Method	Description	Timing
Biological Control Agents Feeding on Yellow Starthistle Seed Heads	*1. Bangesternus orientalis* *2. Urophora sirunaseva* *3. Chaetorellia succinea* *4. Eustenopus villosus* 5. *Urophora sirunaseva* (second generation) *6. Chaetorellia succinea* (second generation)	May to July May to June May to June June to August July to August July to August
Redistribution	1. *Bangesternus orientalis, Urophora sirunaseva*, and *Chaetorellia succinea* can be obtained by contacting your county agricultural commissioner's office. 2. *Eustenopus villosus* can be obtained by contactiong your county agricultural commissioner's office. 4. Both weevils, *Bangesternus* and *Eustenopus*, can be collected using a sweep net during mid-day. Set net contents on a tray and remove weevils as they emerge and placed into a container. They can be stored in the refrigerator for 4 days prior to release. 5. Collection of flies, *Urophora* and *Chaetorellia*, are difficult and some areas may host parasites of the flies. Use the state's redistribution program run by your county agricultural commissioner's office.	Late May to early June Late June Late June
Conservation	1. Any control method that removes yellow starthistle will also reduce the number of biological control agents. In general, most of these insects will move 300 feet to 600 feet per year back onto a site where yellow starthistle was controlled but has reestablished.	May to August

When Do I Mow?

Mowing – This is 5% bloom. Mow when yellow starthistle is at this stage.

Mowing- This is 50% bloom. Seed has already set so no seed reduction but it will not grow